SCWDS BRIEFS

A Quarterly Newsletter from the

Southeastern Cooperative Wildlife Disease Study
College of Veterinary Medicine
The University of Georgia
Athens, Georgia 30602

Phone (706) 542-1741 **FAX (706) 542-5865**

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The Good, The Bad, and The Ugly Truth: An Update on HPAI H5 in Wild Ducks

Active surveillance for clade 2.3.3.4 highly pathogenic avian influenza (HPAI) H5 viruses in North America under the *2015 Surveillance Plan for HPAI in the United States* (published by USDA in July 2015) will begin in force during late summer/early fall with the onset of duck-banding efforts. The goal of the surveillance plan is to collect samples from 41,000 apparently healthy wild birds from targeted areas across the country by March 2016. Passive surveillance for HPAI viruses in cases of avian morbidity and mortality is ongoing and has resulted in recent positives from Canada geese in Michigan and a chickadee in Minnesota.

Wild ducks generally are accepted as a reservoir for low pathogenicity avian influenza (LPAI) viruses, and this seems to have been extrapolated to regard them as reservoirs for HPAI H5 viruses. This may be correct, but current data from the Mississippi Flyway do not support a widespread distribution of these viruses at this time. The HPAI H5N2 virus first was detected in the Mississippi Flyway in domestic turkeys in Minnesota in February 2015, and subsequently in snow geese in Missouri during March. Since those detections and numerous outbreaks among domestic poultry flocks in the Upper Midwest, active surveillance of asymptomatic ducks within this flyway has failed to yield a single HPAI H5 virus. These negative samples include 3,318 fecal samples from waterfowl collected and tested by the Minnesota Department of Natural Resources, USDA-APHIS-Wildlife Services, and the USGS National Wildlife Health Center during March and April, and 2,013 combined cloacal and oropharyngeal swabs collected from ducks in March in Texas and Louisiana as part of collaborative work between USGS, Alaskan Science Center, and SCWDS.

The Minnesota and Texas/Louisiana samples yielded numerous LPAI viruses; 100 (3%) detected by RT-PCR in Minnesota and 64 (3%) by virus isolation in Texas/Louisiana. These are typical prevalence estimates for influenza viruses in spring-migrating ducks, and these isolations validate the field and laboratory procedures used in this work. Although Pennsylvania is not in the Mississippi Flyway, 371 swab samples from diving and dabbling ducks collected during March 2015 by the Pennsylvania Game Commission also have been tested by SCWDS, with only three (1%) LPAI viruses isolated from these birds.

Although this is potentially GOOD news, there are some BAD problems associated with the interpretation of these types of data. It is possible, for example, that unlike the Pacific Flyway, where there was clear evidence of wild duck involvement, infections in ducks in the Mississippi Flyway may have been minimal. Negative results from the Minnesota collections support this, and negative results from the Texas/Louisiana samples are more consistent with a later introduction of H5N2 into this flyway (possibly from the West during 2015), rather than an introduction during the 2014 fall migration. Unlike the Pacific Flyway, where most confirmed HPAI H5 isolates from wild birds came from ducks, most isolates from the Mississippi Flyway came from geese.

Now for the UGLY truth: we have very little information on the epidemiology of clade 2.3.3.4 HPAI H5 viruses in North America, and therefore we cannot predict what will happen next. We do not know if wild birds will serve as reservoirs of these viruses, we do not know if HPAI outbreaks will reemerge in poultry this fall, and we do not

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know if the virus could become a human pathogen—hopefully the answer is "no" on all three accounts. Even with the increasing amounts of data being accumulated, it's going to be a substantial challenge to elucidate and understand the epidemiology of these HPAI H5 viruses in North American wild bird populations.

The HPAI H5N1 introduction into western Europe in 2005 is the only historical event that somewhat resembles our current situation. In that case, H5N1 killed wild waterfowl (primarily swans and geese), spilled over into domestic poultry, and although cases in wild birds were detected during the following two years, it did not become established in wild bird populations. Let's hope for a similar outcome. (Prepared by David Stallknecht and Justin Brown)

VSV Outbreak in the West; New OIE Reporting Guidelines

The vesicular stomatitis (VS) outbreak in livestock in the western USA that we reported on in the July 2014 *SCWDS BRIEFS* continues. During 2014, 587 equines and 60 bovines on 435 premises in four states (Arizona, Colorado, Nebraska, and Texas) were diagnosed with VS. The last affected premises were released from quarantine in January 2015. On April 29, 2015, VS was found in two horses in New Mexico, and to date has been detected on 215 premises in seven states (Arizona, Colorado, South Dakota, Texas, Utah, and Wyoming).

Vesicular stomatitis is caused by a rhabdovirus and primarily affects equines and cattle, but also may affect swine, sheep, goats, llamas, and alpacas, as well as humans who have handled infected animals (rarely). Clinical signs of infection with vesicular stomatitis New Jersey virus (VSNJV), the causative agent associated with the current outbreak, include excessive salivation and blanched, raised, or broken vesicles around the upper surface of the tongue, surface of the lips and around nostrils, corners of the mouth and the gums, teats, and coronary bands. These signs are similar to those of foot-and-mouth disease in cloven-hoofed animals, and therefore the disease must be reported to the World Organization for Animal Health (Office International des Epizooties [OIE]) when it is detected. As such, identification of VS in livestock can lead to domestic and international regulatory and economic impacts.

In the past, VS was listed as a multispecies disease by the OIE, and detection of the disease in any livestock species was reportable. However, the OIE adopted a resolution in 2014 that deleted VS from the OIE list of reportable diseases when it occurs in equines. Vesicular stomatitis is still considered a multispecies disease, and its detection in cattle and other livestock species must be reported by the country's veterinary authority to the OIE, but its detection in equines does not. Within the United States, VS in equines remains reportable to the state's veterinary authority and the USDA.

This change allows greater flexibility in how VS is managed with respect to equine cases and now allows local veterinarians to perform the initial investigations, collect samples, and collaborate with state veterinarians and other animal health officials regarding movement restrictions and quarantines. Additionally, quarantines can be released as soon as 14 days after the onset of clinical signs of the last affected horse on a premises. (Prepared by Danny Mead)

Porphyria in a Feral Hog

An adult, female, feral hog harvested in January 2015 in Avoyelles Parish, Louisiana, was noted by the hunter to have abnormally colored bones. Veterinarians with the Louisiana Department of Wildlife and Fisheries diagnosed porphyria in this animal and submitted samples of bone and muscle to SCWDS for confirmation.

Gross examination of the bones revealed diffuse chocolate-brown discoloration and intense red fluorescence when exposed to ultraviolet light (Figures A and B). There were no lesions in the adjacent skeletal muscles. These gross findings are consistent with a diagnosis of porphyria.

Porphyrias are a group of related disorders characterized by enzyme deficiencies in the synthesis of heme, an important component of the hemoglobin protein. These enzyme deficiencies lead to the accumulation of heme

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precursor molecules (porphyrins) in various tissues. Porphyrias are classified by the location of excess production of porphyrins – either in blood cells (erythropoetic porphyrias) or in the liver (hepatic porphyrias).

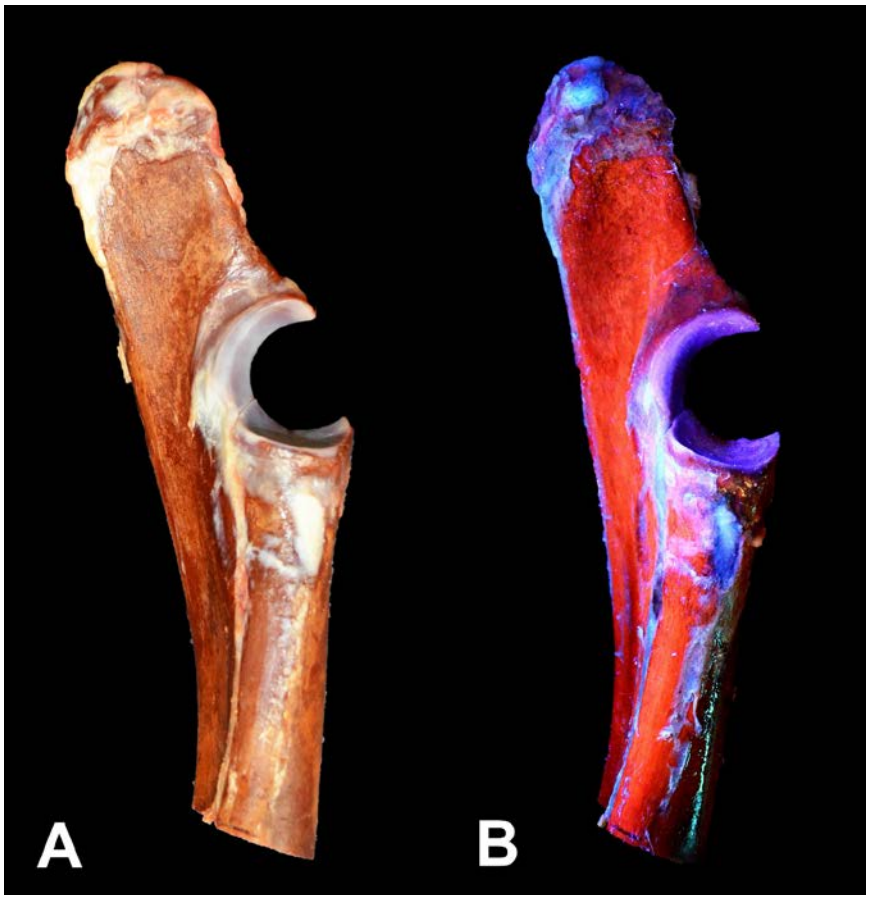
While porphyria has not been documented previously in feral swine, congenital erythropoetic porphyria (CEP) has been reported rarely in Duroc, Belgian Landrace, and mixed-breed domestic swine. This disease is suspected to have an autosomal dominant mode of inheritance, which can lead to occurrence of multiple affected animals descended from a single carrier in the breeding stock.

Clinical signs of CEP in domestic swine include delayed growth, anemia, porphyrin excretion in urine, and accumulation of porphyrins in bones and teeth. This disease does not appear to cause significant morbidity or mortality in affected swine. Skin lesions resulting from photosensitization are a common feature of erythropoetic porphyrias in humans and domestic animals, but have not been reported with CEP in swine.

Acquired erythropoetic porphyrias have been reported in young sheep and deer exposed to the organochlorine pesticide lindane, which interferes with heme synthesis pathways. These animals had patchy discoloration of bones, because porphyrins are only deposited in developing bone and do not affect pre-existing mature bone. Interestingly, erythropoetic porphyria is a normal physiologic feature of fox squirrels, which exhibit red-brown discoloration of the bones, teeth, and soft tissues.

Hepatic porphyrias are less well-characterized in animals, and occasionally are associated with toxins. A single study in young domestic pigs demonstrated that administration of certain hepatotoxins caused porphyrin accumulation in the liver and gallbladder of treated animals, in addition to skin lesions consistent with photosensitization. Bone pigmentation was not observed in these cases.

Features observed in the bones of this feral hog, combined with the reported absence of skin lesions, suggest that congenital erythropoetic porphyria is most likely the form of porphyria



Figures A and B. A) Chocolate-brown discoloration of the ulna. B) Red fluorescence under ultraviolet light.

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observed in this animal. However, hepatic or acquired erythropoetic porphyria cannot be ruled out in this case. While affected domestic cattle and swine are condemned at slaughter, porphyrins are naturally present in the tissues of animals and ingestion of meat from animals with porphyria is not known to cause health problems. (Prepared by Betsy Elsmo)

A Note to Our Readers

We thank you for your sustained interest in our quarterly newsletter, the SCWDS BRIEFS. We continue to receive positive feedback from many readers, which lets us know that we are still providing items of interest to you in each issue.

One difficult aspect of putting out a publication such as the BRIEFS is maintaining the mailing list. We want to reach as many of you as we can, but can do so only if you let us know you want to be included on the mailing list, notify us of any address changes, or inform us of someone else you know who would like to be added to the mailing list. Of course, if you want to reduce the volume of mail coming into your home or office, you may opt to be removed from the regular mailing list and have your name added to our email list to be informed when each new issue is posted on our website. This way, you usually can read the newsletter at least 10 days before a mailed copy would arrive. As always, if you have suggestions for improvement of the BRIEFS, please let us hear from you. Our goal is to provide information of interest to you.

Recent SCWDS Publications Available

Below are some recent publications authored or co-authored by SCWDS staff. Many of these can be accessed online from the web pages of the various journals. If you do not have access to this service and would like to have a copy of any of these papers, let us know. Many can be sent to you electronically with minimum effort; others will be mailed to you. For your convenience, please indicate requested publications, fill out the form on page 7, and check the appropriate box to receive either an electronic copy or a hard copy and return it to us: SCWDS, College of Veterinary Medicine, University of Georgia, Athens, GA 30602.

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